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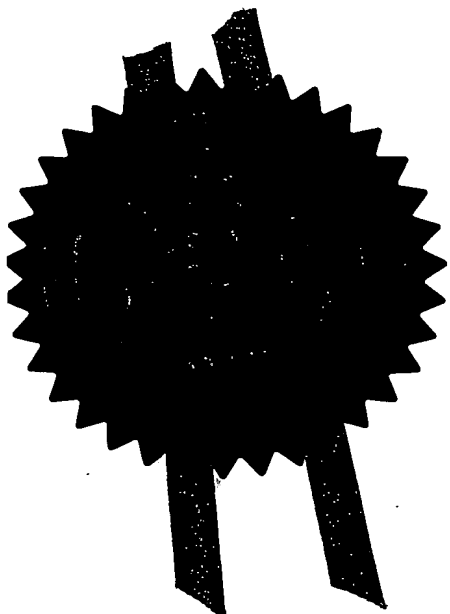
I, the undersigned, being an officer duly authorised in accordance with Section 74(1) PAT(4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

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Signed *AmBrewster*

Dated 7 February 2003

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GB 02021457.9

By virtue of a direction given under Section 30 of the Patents Act 1977, the application is proceeding in the name of

JOHNSON MATTHEY PLC,
2-4 Cockspur Street,
Trafalgar Square,
LONDON,
SW1Y 5BQ,
United Kingdom

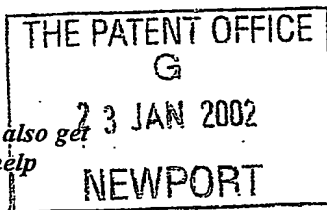
Incorporated in the United Kingdom

[ADP No. 08519803001]

Patents Form 1/77

Patents Act 1997
(Rule 16)

**The
Patent
Office**



1/77

The Patent Office

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Gwent NP9 1RH

Request for grant of a patent

(see the notes on the back of this form. You can also get an explanatory leaflet from the Patent office to help you fill in this form)

1	Your reference	SYN 51022			
2	Patent application number (The Patent Office will fill in this part)	0201457.9			
3	Full name, address and postcode of the or of each applicant (underline all surnames)	IMPERIAL CHEMICAL INDUSTRIES PLC Imperial Chemical House Millbank, London SW1P 3JF			
	Patents ADP Number (if you know it)	935003			
	If the applicant is a corporate body, give the country/state of its incorporation	United Kingdom			
4	Title of the invention	MERCURY REMOVAL			
5	Name of Your Agent (if you have one)	GRATWICK, Christopher			
	"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)	Synetix Intellectual Property Department PO Box 1, Room N101 Belasis Avenue Billingham Cleveland England, TS23 1LB			
	Patents ADP Number (if you know it)	7 912249001			
6	If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or each of these earlier applications and (if you know it) the or each application number	<table border="0"> <tr> <td style="text-align: center;">Country</td> <td style="text-align: center;">Priority Application number (if you know it)</td> <td style="text-align: center;">Date of Filing (day / month / year)</td> </tr> </table>	Country	Priority Application number (if you know it)	Date of Filing (day / month / year)
Country	Priority Application number (if you know it)	Date of Filing (day / month / year)			
7	If this application is divided or otherwise derived from an earlier UK application, give the number and filing date of the earlier application	<table border="0"> <tr> <td style="text-align: center;">Number of earlier application</td> <td style="text-align: center;">Date of Filing (day / month / year)</td> </tr> </table>	Number of earlier application	Date of Filing (day / month / year)	
Number of earlier application	Date of Filing (day / month / year)				
8	<p>Is a statement of inventorship and of right to grant of a patent required in support of this request?</p> <p style="text-align: right;">Yes</p> <p>Answer yes if:</p> <p>a) any applicant named in part 3 is not an inventor, or</p> <p>b) there is an inventor who is not named as an applicant, or</p> <p>c) any named applicant is a corporate body.</p> <p>See Note (d)</p>				

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Continuation sheets of this form	-
Description	2
Claim(s)	1
Abstract	1
Drawings	-

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Priority documents

Translations of priority documents

Statement of Invention and right to grant of a patent (*Patents Form 7/77*)

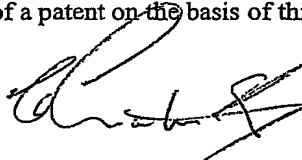
Request for Preliminary Examination and search (*Patents Form 9/77*)

Request for Substantive Examination (*Patents Form 10/77*)

Any other documents
(*Please specify*)

- 11 I/We request the grant of a patent on the basis of this application

Signature



Date

22.01.2002

- 12 Name and daytime telephone number of person to contact in the United Kingdom

CHRISTOPHER GRATWICK
01642 523860

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been issued, or any such direction has been revoked.

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Mercury removal.

This invention relates to the removal of mercury from fluids, and in particular to the removal of elemental mercury and organic mercury compounds from gases and liquids, particularly from hydrocarbon feedstocks.

Elemental mercury and/or organic mercury compounds may be present as a contaminant in hydrocarbon streams, e.g. gas or oil as extracted from the earth. The presence of mercury or organic mercury compounds is undesirable since elemental mercury can cause severe corrosion problems while organic mercury compounds tend to be toxic and/or readily decomposed to elemental mercury. Removal of such elemental mercury and organic mercury compounds is desirable. We have found that certain sulphided ion exchange resins can absorb significant amounts of mercury.

Accordingly the present invention provides a method for the removal of mercury and organic mercury compounds from a hydrocarbon feedstock comprising passing the feedstock through a bed of a sulphided ion exchange resin containing primary or secondary amino groups.

The absorption may be effected at temperatures in the range -10°C to $+100^{\circ}\text{C}$ and preferably under sufficient pressure that the hydrocarbon is in the liquid or "dense phase" state, at the desired absorption temperature. By the term "dense phase" we mean that the hydrocarbon is at a pressure that is above the upper dew point curve and at a temperature above the critical temperature (but generally below the temperature of the maxcondentherm point - which is the maximum temperature of the dew point and bubble point curves).

In addition to absorbing the elemental mercury, the sulphided ion exchange resin may remove organic mercury compounds by catalysing their decomposition with the absorption of the mercury thus formed or by other means.

Amine-containing ion exchange resins as supplied often contain a significant amount of water which can affect the performance of the absorbant. Accordingly it is preferred that the ion exchange resin is dried, e.g. by extraction with a suitable solvent such as methanol, before use. The ion exchange resin, of which Amberlyst A.21 is a typical example, is preferably employed in the form of a fixed bed of shaped units, e.g. spherical granules, preferably having maximum and minimum dimensions in the range 0.5 to 10 mm. Prior to use for mercury absorption, the ion exchange resin is sulphided, for example by contact with a solution of elemental sulphur or an organic or inorganic di- or poly-sulphide in a suitable solvent, e.g. a hydrocarbon.

Where the hydrocarbon stream also contains sulphur, the ion exchange resin may be sulphided in situ. However, in order to ensure that the mercury is absorbed, it is preferred that at least the inlet portion of the bed of ion exchange resin is sulphided before a mercury containing stream is passed through the bed.

Hydrocarbons that may be treated include any that are liquid under the operating conditions. Preferred hydrocarbons include natural gas liquids and gasoline.

Claims

1. A method for the removal of mercury and organic mercury compounds from a hydrocarbon feedstock comprising passing the feedstock through a bed of a sulphided ion exchange resin containing primary or secondary amino groups.
2. A method according to claim 1 wherein the feedstock is contacted with the sulphided ion exchange resin bed at temperatures in the range -10°C to $+100^{\circ}\text{C}$ under sufficient pressure that the hydrocarbon is in the liquid or "dense phase".
3. A method according to claim 1 or claim 2 wherein water is removed from the ion exchange resin before sulphiding.
4. A method according to any one of claims 1 to 3 wherein the ion exchange resin is in the form of a fixed bed of shaped units having maximum and minimum dimensions in the range 0.5 to 10 mm.

Abstract

Removal of mercury from fluids by passage through a bed of a sulphided ion exchange resin containing primary or secondary amino groups.

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